

NUTRI-BLEND USER MANUAL

Blending controller for remixing run-off nutrient with water to obtain a preset EC

For use with either analogue 0..10V, 2V..10V or switched 24V AC three way modulating valves

1 Overview

The Blender is a controller dedicated to blending run-off with raw water to a constant EC

The Blender simply measures the resulting EC at the output of a 3 way mixing valve and adjusts the valve to achieve the setpoint. The valve used may have a 0..10V control input or else be a switched 24V AC drive valve. The 0V (0%) side must correspond to 0% run-off (100% raw water) while the 10V (100%) side would correspond to 100% run-off with 0% water.

In addition to the EC sensor, the controller has two **voltage free** switch inputs, one to a float switch used to detect that the run-off collection sump is empty (this forces the valve to the 0% ie water only state) and the other connects to a voltage free contact on the pump relay which detects when the irrigation pump is running. When this contact is opened blending is stopped and the valve returns to its preset initial value. This ensures that whenever the pump starts the valve is always ready in its preset position. This may be 0% to stop any siphoning of run-off or else may be set to the start position. The start position is the percentage open point that the pump goes to immediately the pumps starts and should be set by the user to be as close as possible to its usual running point.

The pump run contact must be a normally open contact that closes when the pump is running.

The low level float switch must have a contact that closes when nutrient is available and opens when empty. If this switch is not required then the connections to the Blender must be “jumped” to simulate “nutrient available”

2 Settings

Most of the settings screens will not be used in a straight forward blender and are included only for completeness. The relevant screens are shown in BOLD

The controller is set up using two methods :-

1) Small slide switches (DIP switch) under the connection cover and 2) “soft” settings from the PC or front panel. The switch settings are mainly to do with the units used (EC or CF) and whether pH is to be measured. In this chapter we will look at the everyday settings made at the PC or from the controller front panel.

2.1 The Menu system (from the controller front panel)

The menus are arranged in two levels. At the top level the ‘main menu’ shows the major groupings of settings and beneath that the sub-menus show the detail. To move

from a main menu item down to its sub-menu, press the ‘enter key’ (up arrow). When in a sub-menu, just press the ‘exit’ (save) key to exit back up to the main menu. Alternatively, just wait without pressing any keys and the controller will automatically return to mode 0 after about 20 seconds. If this happens any changes made will be discarded. Note that the sub-menu items start with the same number as its main menu parent. Remember, that after a setting has been changed, you must press the save button to make the change permanent.

MODE	FUNCTION
Default screen	Display EC, Valve Target% and Valve Actual % (if pH is used then EC, pH and valve Actual%)

Main Menu

M1	SET POINTS
M3	CALIBRATION
M4	TIME/DATE
M5	ALARMS
M6	SYSTEM

Sub menu from M1 - Setpoints

M10	EC Setpoint
M11	Blend start percentage (valve position when pump starts to run)
M12	Valve operation (Auto / use start% / use fixed%)
M13	Blend fixed percentage
M14	Blend detent seconds (time between one “nudge and the next”
M15	Blend scale factor (set for quick response without overshoot)
M16	Rest position of valve when pump stops
M17	Analogue valve voltage range (0..10V or 2..10V)
M18	Valve “run-time”. This must be set for both analogue and switched valves

Sub menu from M2 - Calibrate

M22	Cal EC
M20	Cal pH7 optional pH reading
M21	Cal pH4

Sub menu from M3 -Time and Date

M30	Display Date and Time
M31	Clock Set Minutes
M32	Clock Set Hours
M33	Clock Set Days
M34	Clock Set Months
M35	Clock Set Year

Sub menu from M4 - Alarms

M40	Alarm ON/OFF
M41	Alarm EC limits MAX
M42	Alarm EC limits MIN
M43	Alarm Detent (Time until alarm sounds after fault detected)

Sub menu from M5 - System

M50

PC comms address (set same address at PC)

Valve start position. This should be set as close as possible to the normal operating position of the valve. When the pump first starts the valve will move immediately to this position and from there it will nudge a little more open or closed to adjust the measured EC.

Blend scale factor (0..100%) (the higher the number the faster the valve will respond but if too high will overshoot and continually “hunt”) – probably start with a number such as 20% and if no overshoot or “hunting”, gradually increase until hunting is observed and then back off to assure stable operation.

Valve operation mode. This allows you to select how the valve will operate. You can choose from automatic, fixed percentage or start percentage. Seeing as the start percentage is normally set at the normal operating position this selection allows you to test that the “start percentage is indeed, set correctly.

Fixed percentage. This allows you set a constant blend percentage.

Blend Detent. This sets the time delay between a valve movement and the EC probe reading changing. It allows time for the preceding adjustment to take effect and to be measured at the probe so as to avoid unnecessary valve movements and overshoot.

The scale factor allows you to change the sensitivity of the valve relative to the EC error – try 20% as a starting point, if the valve is very slow to move to the correct position then increase this but if it overshoots or hunts then decrease it.

Valve voltage range. This is only applicable to analogue valves and a selection can be made from either 0..10V or 2..10V

Valve run-time. This is the time in minutes and seconds for the valve to travel from the fully closed position to the fully open position. IT MUST BE SET FOR BOTH ANALOGUE AND SWITCHED VALVES.

2.2 Settings from the PC

The screenshot shows the 'CompuGrow 3.0.2.3 - (02) test : blend 1.03' window. The 'Readings and Settings' tab is active. The 'Current Values and Alarm Status' section displays the following:

Current Values and Alarm Status		
EC	Valve %	Alarm
2.9	30	
Min: 2.5		Alarm Detent: 1 mins
Max: 3.5		
Enabled: <input checked="" type="checkbox"/>		

The 'Set Points' section contains the following settings:

Set Points	
EC Target	3 mS/cm
Start percentage (automatic operation)	30 %
Valve operation	Automatic <input checked="" type="radio"/> Use Start % <input type="radio"/> Use Fixed % <input type="radio"/> 50 %
Blend detent	5 secs
Blend scale factor	20 %
Pump stopped valve percent	Start % <input checked="" type="radio"/> Zero % <input type="radio"/>
Modulating valve volt range	0V to 10V <input checked="" type="radio"/> 2V to 10V <input type="radio"/>
Switched valve run-time	0 mins 20 secs

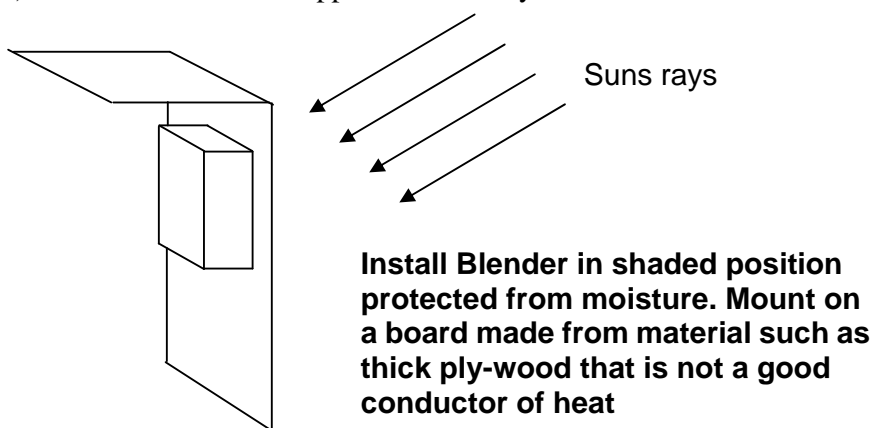
At the bottom of the window are 'Save' and 'Cancel' buttons.

This is basically the same as setting from the controller. Please see the explanation of settings on the previous page

3 Installation of the controller

IMPORTANT:

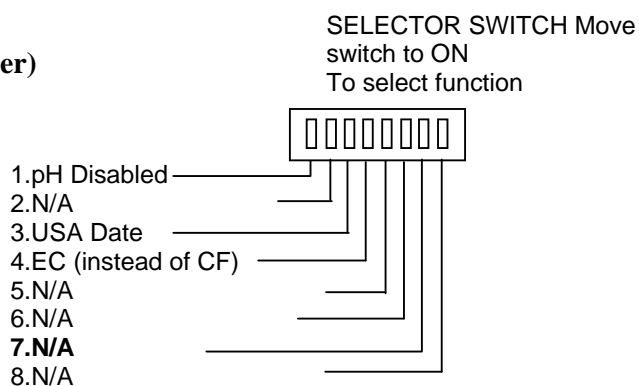
1) **Check that the Blender is correctly rated for your power supply voltage**
2) **The Blender must be installed (and stored) in a shaded, cool, dry, well ventilated position.** This may be inside a greenhouse which is fully controlled so that the relative humidity does not regularly exceed 90%. For uncontrolled greenhouses, propagation houses, or other high humidity situations it must be installed in a plant room next to the greenhouse which itself is cool, dry, shaded from direct sun and well ventilated. It must never be left in full sunlight or in very hot conditions such as in an automobile. If installed within a greenhouse this normally means that a special shade/drip cover must be provided and shown below. This is important as the surface temperatures of items in a greenhouse in summer, in full sun, may easily exceed 60 deg C (140 deg F). If this is allowed to happen the warranty is voided.



Position the sample pot within close reach of the controller but not where the controller is liable to get splashed if the sample pot overflows etc. Ensure that the leads to the sensors will easily reach between the controller and the sample point.

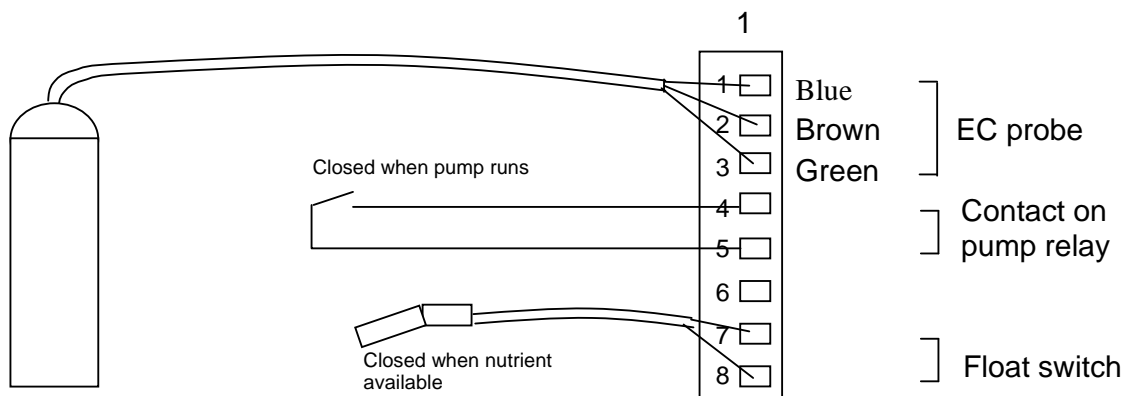
Set selector switch (located under side cover)

The switches can be set to suit your personal preference.



Connect the EC probe pump relay contact and float switch

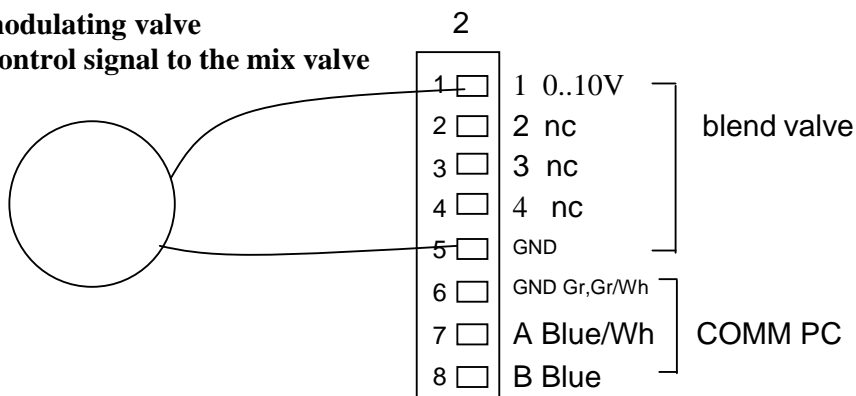
The optional pH electrode simply connects to the BNC connector on the front panel. The EC probe and the pump run contact and float switch are connected to connector 1 (the leftmost connector) which is located under the cover on the right hand side of the controller.



Connection of EC probe, pump relay and Float

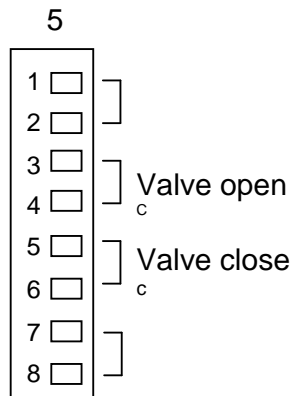
For an “analogue” modulating valve

Connect the 0..10V control signal to the mix valve



Note that to ensure noise immunity the 24V AC required by the valve must be supplied by a separate power supply and **not** obtained from the NutriDose

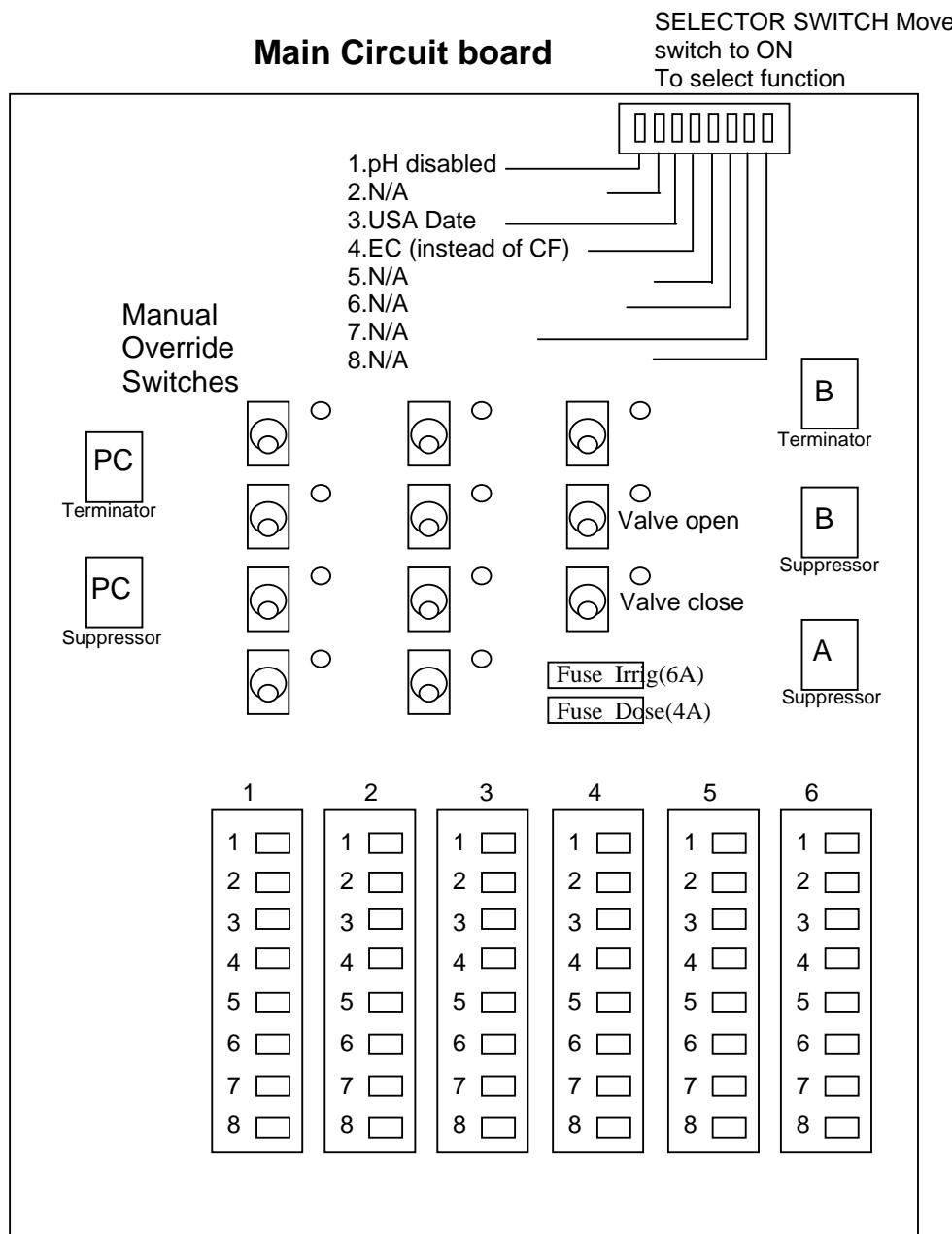
Connections for 24V AC switched valve



Run-time setting for a 24V AC switched valve

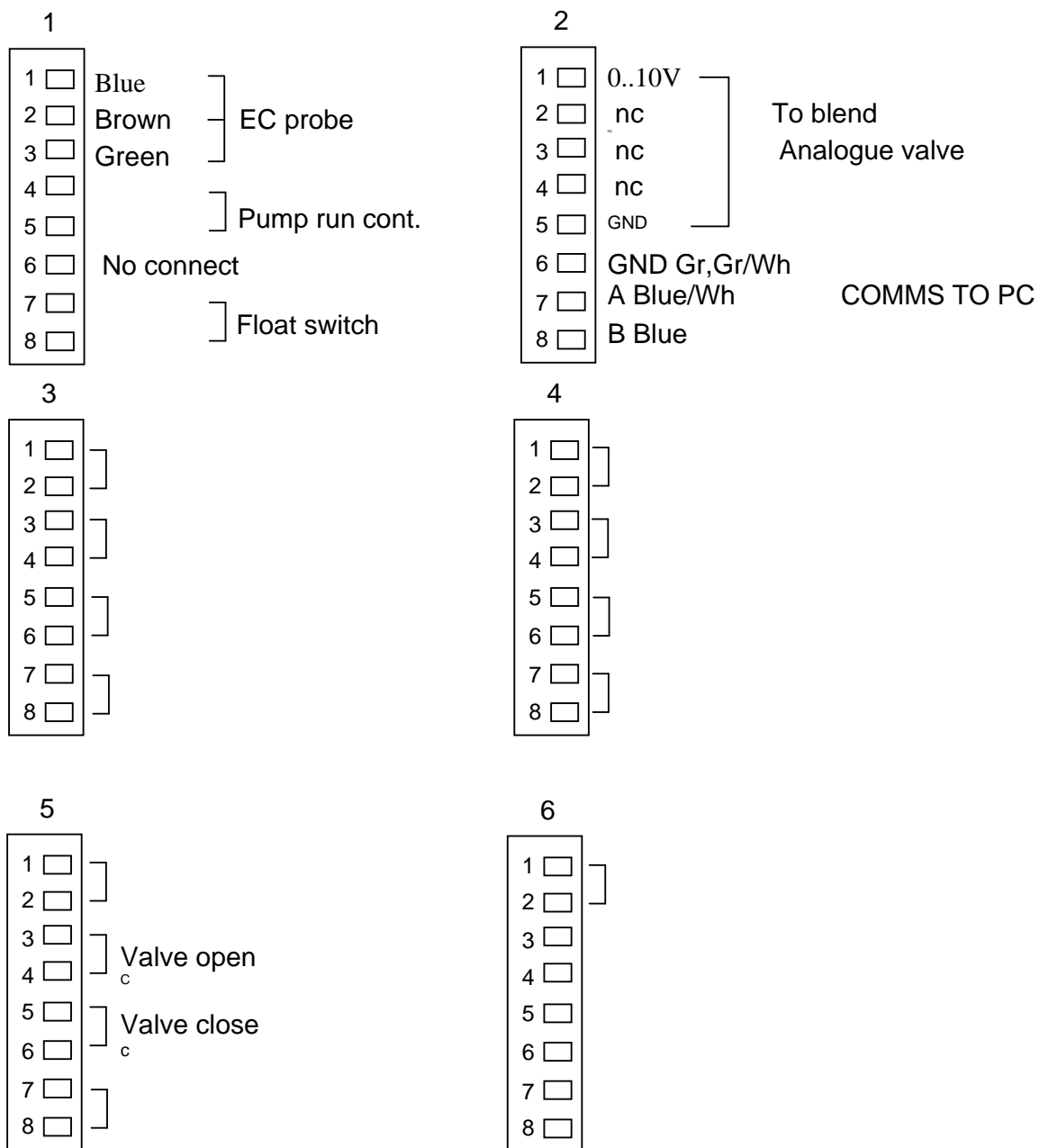
The valve should be run by manually switching the override switches from one side to the other and its run-time accurately timed in seconds. This must then be entered either on the controller or at the PC.

IMPORTANT:- Before connecting the controller to the mains power supply, check that the voltage sticker on the side of the case matches the voltage for your mains power. This will either be 100-120V or 200-240V.



Note that only low voltages (not mains) can be connected to these contacts.
The manual override switches should all be set to the central “off” position as they are not used in the Blender application.
DOWN=Automatic; CENTRE = OFF; UP = ON

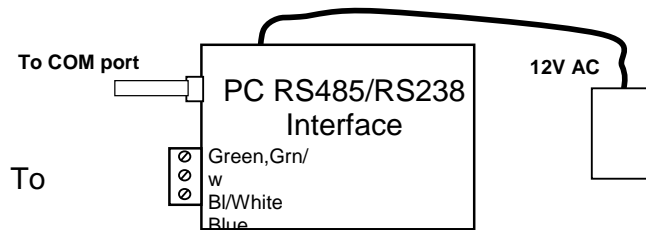
Connectors



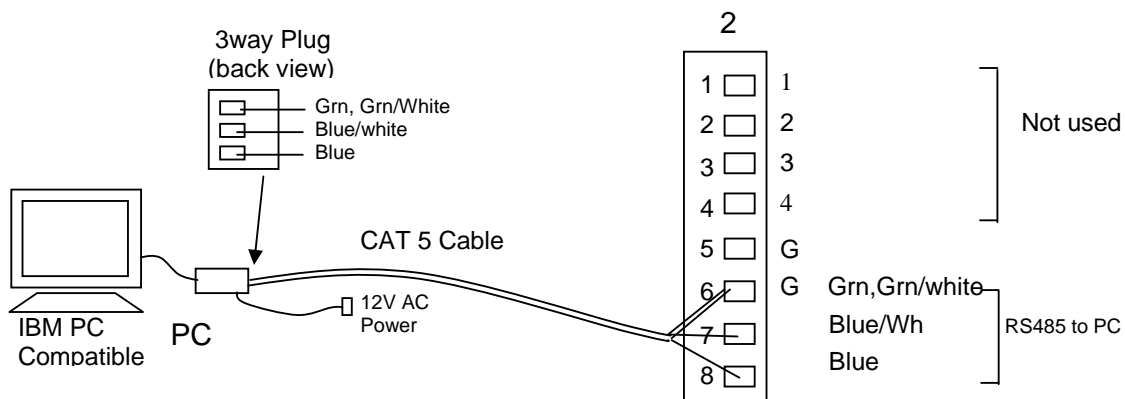
4 Installation of Compugrow Software on the PC

4.1 The PC Interface.

The RS484/RS232 optically isolated interface box should be installed adjacent to the PC computer. It requires a 12V AC supply. A lead is supplied to connect this to a free DB9 COM port on the back of the PC. A CAT 5 cable (computer network cable) should be used to connect between the PC interface and the controller as shown in the diagram.



PC interface connections



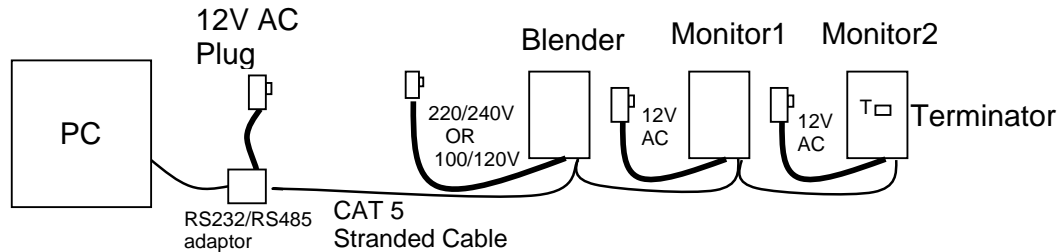
Connection of PC interface to the controller

4.2 Communication addresses.

When the PC requests data from a controller or monitor it first sends the address for that unit. All units connected to the PC must have a different address. The base address for these controllers is 34. At the controller, press the mode key to get to SYSTEM and press enter. Here you will find the "address" number. Press the up or down arrows to change the address to a number that is different to all other units connected to the PC. Typically, set the first controller to 34, the next to 35 and so on. After setting the address, press save to store it in permanent memory. Make a note of the address of each controller/monitor and its type (eg Blender) as you will need to enter this information on the PC.

4.3 Terminator.

The CAT 5, RS485, data cable starts at the PC interface and loops in and out of ALL devices until it reaches the furthest unit. Inside all controllers and monitors will be found a terminator plug. This is a very small circuit board with a small resistor and capacitor on it. These terminators must be removed from all units except for the one at the end of the cable. To locate the terminator, refer to the diagram of the main circuit board in section 3.1.



PC connection showing a single terminator at the end of the cable

4.4 Installation of the Compugrow software

The CompuGrow software is suitable for use on a PC compatible computer running Windows 95/98/2000/XP/Vista. The computer must have a free serial COM port and should be a Pentium or better. If the PC does not have a serial COM port then a USB to serial converter must be obtained.

To install the software on your PC, insert the disk in the drive and execute the CompuGrow self-installing program. You will be prompted during installation to select a folder. The default folder is C:\Program Files\Compugro\... When the program is executed it will suggest creating a working folder in "My Documents" and if you agree to this it will create some sub-folders under this folder. Each system (greenhouse) installed will have its own sub-folder where the log files for each of its monitors and controllers is stored. Each file will save the data for the whole current month and the name of the file contains the date (year and month) to make file management easy. Once installed, the program may be executed in the usual way. The first time it is run it is necessary to create a new system and then specify the type and addresses of all controllers and monitors within that system. The system name is normally the name of the greenhouse and the controller a short name like "blender, Irrig, vents etc.

4.5 Configuring the PC software.

Before running the software it is best to install all the controllers and monitors. They should all have their date and time setting checked and each device must have its address set to a unique number. Remember to save the addresses after making any changes and make a note of them as you will need to have them when installing the PC software.

Now, at the PC, run the compugrow.exe application and then set up as follows.

When the Compugrow software is first executed the immediate task is to select the required security access level. In order to set the system up, security must either be “disabled” or else you must select ‘advanced’ and enter the advanced password which is ‘consult’. The basic level password is ‘grower’. These are the default passwords which can be changed to anything you desire when in advanced mode. Alternatively, from advanced mode you can disable security by selecting setup/security/disable. Next, select the serial COM port that the RS232/RS485 adaptor is connected to. (Note that the adaptor must be one supplied by Autogrow as it performs some special functions as well as converting the signal levels and providing optical isolation.)

Under “setup” select “add” to add a new system then give the system a name (usually the name of the greenhouse eg lettuce 1) also check the controller box and monitor box if you also have any monitors in the system.

The idea of having different “systems” is that in a large installation where you might have a number of controllers and/or monitors in each greenhouse, it allows you to collect together all of the devices from the one greenhouse as one system so that when you view them they are not muddled in with devices from the other houses. However, if you are only intending say one or two controllers per greenhouse then it is probably more convenient to put all devices into one system.

Once a system has been added, select setup/system setup/configure/<system name> And for each controller and monitor, add the address (as set at the actual controller), select the type of controller, enable it and finally click on “save”.

The PC will now try to communicate with the device and values should appear on the “Readings and Settings” tab. If not, try clicking on “refresh” on the main menu bar and observe the message at the bottom, right of the screen. If this says “offline” then the communication link has failed and you will need to recheck that everything is wired correctly and switched on etc. Also recheck all settings. If still not working refer to the fault finding section.

Finally set the logging frequency to be every 5 minutes. The software creates one file for each monitor or controller for each month. Obviously a logging frequency of one minute will create much larger files than if set to 5 minutes and should only be used when you really require that level of detail.

Maintenance

Every two weeks:-

Thoroughly clean the EC probe.

Remove the shroud (if fitted), scour the face with a mild bathroom abrasive like Jif (NOT Lemon JIF as this contains oils) on an abrasive nylon pad (ScotchBrite) and then rinse in clean water. DO NOT TOUCH THE PROBE FACE as your perspiration may contain oil.

Replace the shroud fully (so that the face of the probe is central in the round side windows)

Shake off all excess water and place in the CF 27.7 (EC 2.77) standard solution. Allow to stand for ten minutes before calibrating. The up/down buttons may need to be pressed a number of times (or held down for a while to invoke auto-repeat) to make the displayed values change to the correct reading. Press *save* to store the new calibration.

Warranty

The warranty on the controller and EC sensor is limited to 2 years – return to factory. Before returning the unit for service you must call Autogrow Systems Ltd for a return authorisation .

This warranty specifically excludes any parts that have been broken or damaged by water, chemical attack or excessive temperature. In particular, the controller and PC interface must be stored and used in a dry, shaded and well ventilated situation. At no time must the case temperature be allowed to exceed 60 deg C (140 deg F).

This warranty specifically excludes liability for consequential damages or for charges for labour or other expense in making repairs or adjustments, or loss of time or inconvenience.